ORIGINAL ARTICLE

Audit on management of eclampsia at Sultan Abdul Halim Hospital

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SUMMARY

Introduction: Maternal mortality and morbidity from eclampsia continues to be seen around the globe. Local Key Performance Index on recurrence of eclamptic fits did not meet targets, thus this raised the issue whether the care provided adhered to the standard management for eclampsia.

Methods: This clinical audit was conducted to assess and improve the quality of the service being offered to patient, particularly in managing eclampsia cases. It was conducted according to the audit cycle. It begins with the development of 12 standardized criteria for eclampsia management. First audit was conducted by retrospectively reviewing eclampsia cases from year 2008 till 2012. Strategies for changes were formulated and implemented following the results of the first audit. Second audit was conducted six months after the changes.

Results: The overall incidence rate of eclampsia was 9.17 per 10,000 deliveries. A first seizure occurred during the antepartum period in 52.9% of cases (n=27), intrapartum in 24% (n=11) and postpartum in 21% of cases (n=13). Suboptimal care was mainly on delay of activation of Red Alert system and no treatment for uncontrolled blood pressure. Several strategies were implemented, mainly on improving working knowledge of the staffs and re-engineering hospital Red Alert system. Positive achievements observed during the second audit, shown by a reduction in the number of patients with recurrence eclamptic fits and perinatal mortality rate.

Conclusion: Conducting an audit is essential to evaluate local performance against the standardized criteria. Improvement can be achieved with inexpensive solutions and attainable within a short period of time.

KEY WORDS:
Eclampsia, Clinical Audit, Quality of Care

INTRODUCTION

Eclampsia is the extreme end of hypertensive disorder in pregnancy. Defined as the occurrence of convulsion in association with the syndrome of pre-eclampsia,[1] patient can present with a broad spectrum of signs ranging from severe hypertension with proteinuria to asymptomatic with normal blood pressure.

The general management for eclampsia includes arresting the convulsion, control of blood pressure and expedites delivery.[2] However, deaths due to eclampsia continue to be seen particularly in developing countries where access to obstetrics care is limited. Between 2003 and 2012, eclampsia and pre-eclampsia accounted for 14% of total maternal deaths worldwide.[3] Developing regions had more maternal deaths from hypertension and its complications (14.0%) compared to developed regions (12.9%). Out of this, 14.5% of reported maternal deaths are from Southeastern Asia regions. In Malaysia, eclampsia [categorized under Hypertensive Disorder in Pregnancy] is the fourth leading cause of maternal mortality, accounted for 10.5% of total maternal deaths between years 2006-2008.[4]

As eclampsia is highly associated with maternal mortality and morbidity if not treated effectively, Ministry of Health Malaysia has put eclampsia as one of the performance indicators in the medical programme.[5] The Key Performance Index stated that with prompt and effective management on admission, recurrent eclamptic fits should not occur among patients. However, a review of all eclampsia cases between 2008 and 2012 at Sultan Abdul Halim Hospital found 8 out of 42 (19%, standard=0) cases had more than one fits after hospital admission. Thus, it raised the question whether there are any shortfalls in quality of managing eclampsia. Therefore, this clinical audit was conducted to assess and improve the quality of the service being offered to the patient, particularly in managing eclampsia cases.

The aim of this audit was (I) to review the incidence of eclampsia in Sultan Abdul Halim Hospital, (II) to assess the quality of care among eclampsia patients admitted at Sultan Abdul Halim Hospital based on standardized criteria for best practice, (III) to identify shortfalls in quality of management among eclampsia patients and (IV) to formulate strategies to improve the quality of care.

MATERIALS AND METHODS

This clinical audit was conducted at Sultan Abdul Halim Hospital, Sungai Petani, Kedah. This centre is a tertiary specialist hospital with an annual number of deliveries ranging from 7,000 to 9,000 or 25–40 deliveries per day. This hospital covers the southern area of Kedah State and also serves as a referral hospital for the neighboring state such as the northern part of Perak and Penang. This audit followed the audit cycle; the first audit conducted between January

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2008 and December 2012. After the implementation of changes, the second audit was carried out six months later between July 2013 and June 2014.

Audit procedures:

I. In December 2012, a meeting was convened with all specialists of the Obstetrics and Gynaecology Department to agree on criteria for the management of eclampsia using the state management protocol [6], NICE guidelines [1] and the Cochrane database [7]. A set of 12 standardized criteria (Table I) was developed that related to the management of eclampsia.
II. The next step is to evaluate the current practice against the agreed standard criteria by reviewing case notes of all patients who were diagnosed and treated for eclampsia from January 2008 till December 2012. For data collection, a customized case record (either via medical computerized record or patient's Bed Head Ticket) was retrieved for each case of eclampsia. From this case record, data on maternal characteristics (age, parity and ethnicity), mode of delivery, and neonatal outcome were collected. Data on maternal complication, symptoms and signs presented, blood pressures and treatment given were also recorded.
III. The results of the first audit were highlighted in the 'RESULTS' section. Members of the department also informed regarding the audit findings, and possible strategies for improvement were discussed and implemented (Table II).
IV. The second cycle of audit was conducted (six months after changes implemented) by reviewing all the eclampsia cases between July 2013 and June 2014.

Statistical analysis:

Data was entered and analyzed using SPSS software version 20. All variables of interest were presented in percentages and for numerical data, it was presented as a mean and standard deviation.

Definition of terms [1]:

1. Pre-eclampsia is new hypertension presenting after 20 weeks of gestation with significant proteinuria.
2. Severe pre-eclampsia is pre-eclampsia with severe hypertension with or without symptoms, biochemical or haematological impairment.
3. Significant proteinuria is the urinary protein: creatinine ratio is greater than 30mg/mmol or a validated 24-hour urine collection result shows greater than 300mg protein.
4. Eclampsia is a convulsive condition associated with pre-eclampsia.
5. Mild hypertension: diastolic blood pressure 90–99 mmHg, systolic blood pressure 140–149 mmHg.
6. Moderate hypertension: diastolic blood pressure 100–109 mmHg, systolic blood pressure 150–159 mmHg.
7. Severe hypertension: diastolic blood pressure 110 mmHg or greater, systolic blood pressure 160 mmHg or greater.

RESULTS

A total of 51 cases of eclampsia was recorded among 55, 596 women who delivered during the audit period, yielding an overall incidence rate of 9.17 per 10,000 deliveries. Table III described the incidence trend according to years of the audit period. In total, a first seizure occurred during antepartum period in 52.9% of cases (n=27), intrapartum in 24% (n=11) and postpartum in 21% of cases (n=13).

Maternal characteristics and outcomes:

Women were in two study groups; first audit group and second audit group, had similar maternal characteristic. In both groups, the majority of women who had eclampsia were found to be young age, primigravida, a housewife and from Malay ethnicity (Table IV). Eclampsia commonly occurred during term period of gestation (between 37 and 41 weeks), 52.4% in first audit group (n=22) and 44.4% in second audit group (n=4). Out of 42 cases of eclampsia in first audit group, 73.8% (n=31) delivered via lower segment caesarean section, 23.8% (n=10) had spontaneous vertex delivery, and 2.4% (n=1) had forceps-assisted delivery. For second audit group, 66.7% (6), 22.2% (2) and 11.1% (1) delivered via lower segment caesarean section, spontaneous vertex delivery and forceps-assisted delivery, respectively. Almost half of the population involved in this audit was delivered before 37 weeks (45.3% in first audit grout and 55.6% in second audit group). Two maternal deaths were reported during the first audit, and another maternal death found in the second audit cycle.

Perinatal outcomes:

During the first audit, four fetal deaths (0.09 per 1000 total births) were reported among women with eclampsia, three cases due to stillbirth and one case diagnosed as early neonatal death due to severe prematurity (Table V). Meanwhile during the second audit, all three fetal deaths (0.07 per 1000 total births) were due to stillbirths. This study found that in the first audit group, 21.4% of newborn babies had low Apgar score (< 7) at 5 minutes after birth and 33.3% in newborn babies of the second audit group. The prevalence of low birth weight (birth weight less than 2500g), very low birth weight (birth weight less than 1500g) and extremely low birth weight (birth weight less than 1000g) were 28.6%, 14.3% and 9.6% respectively in the first audit group and 22.2%, 22.2% and 11.1% respectively in the second audit group.

Adherence to standard care:

Table VI summarizes the care given to eclampsia patients as compared to standard, before and after changes implemented. Suboptimal care was mainly on the activation of the Red Alert system and treatment for uncontrolled blood pressure. Otherwise, all patients with seizures were treated with magnesium sulphate and blood investigations were carried out. After remedial measures had been implemented, several improvements were observed in areas with initial substandard care.

DISCUSSION

The incidence of eclampsia at the Sultan Abdul Halim Hospital was 9.17 per 10, 000 deliveries for 7-years period (Jan 2008-June 2014). This figure was lower compared to the incidence rate based on the National Obstetrics Registry, NOR (2011-2012).[9] This audit found several common characteristics that increased the risk of eclampsia such as primigravidae, young mother and term pregnancy. This finding is consistent with results from other studies. [10-12]

Table I: Set of 12 standards that relates to quality issues in management of eclampsia (based on expert review along with local and international guidelines)

NO.	ITEM / STANDARD	DEFINITION
1	Detailed history and documentation	The patient should be attended immediately upon eclampsia and thorough history documented.
2	Activation of red alert system.	Red alert system must be activated to inform the team on duty about eclampsia case.
3	Specialist involved in management plan.	A specialist or consultant obstetrician on duty should be involved in planning the management.
4	Use of Magnesium Sulphate.	Should start immediately and continue for 24 hours. Use the Collaborative Eclampsia Trial[8] regimen for administration of magnesium sulphate.
5	Treatment of high blood pressure.	The goal is to keep the diastolic pressure between 90 mmHg and 100 mmHg to prevent cerebral haemorrhage. Intravenous antihypertensive should be used for severe hypertension.
6	Blood pressure measurement and urine output monitoring.	Monitoring blood pressure and urine output should regularly be done until patient discharge from the ward.
7	Fetal heart monitoring till delivery.	The fetal heart rate need to be monitored continuously in all undelivered patients.
8	Input and output chart maintained for 48 hours.	Input and output chart need to be maintained and recorded until discharged from ward.
9	Deep tendon reflexes test to all patient with magnesium sulphate.	Tendon reflexes should be monitored on regular basis when magnesium sulphate is used.
10	Respiration rate monitored.	Respiratory rate should be monitored on a regular basis when magnesium sulphate is used.
11	Blood taking (PE profiles) for all eclampsia patients.	Blood investigation and urine analysis should be done at regular basis (Full blood count, urine for albumin test, serum creatinine, urea, liver enzymes (Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) and Alkaline phosphatase).
12	Decision on urgent delivery made.	The patient should be delivered as soon as possible once blood pressure stable and blood investigation results available.

Table II: Strategies for change made following the first audit results

1. Improving working knowledge of medical staffs.
   a. Regularly informed all the staff involved regarding the importance of adherence to a standardized protocol. Information can be delivered via Continuous Medical Education session or courses.
   b. Regular training / drills / on-site simulation exercise on eclampsia management especially to junior staff.

2. Re-engineering hospital Red Alert System.
   a. List of person to be contacted during Red Alert activation was put up in all obstetrics facilities.
   b. Information on the importance of activating the Red Alert in eclampsia cases was disseminated to all staff.
   c. Hospital telephone operator was informed regarding existence of this system and how its function.

3. Continuous Postnatal Care.
   a. Delivering information to high-risk patient on the importance of continuous postnatal care and the need for early medical attention for any new onset of pre-eclampsia symptoms.

4. Audit on eclampsia cases at regular interval.

Table III: Incidence of Eclampsia in Sultan Abdul Halim Hospital

Year	No. of deliveries	No. of cases with Eclampsia	Rate per 10, 000
2008	8439	7	8.29
2009	8628	7	8.11
2010	8939	6	6.71
2011	9332	11	11.79
2012	9479	11	11.60
July – Dec 2013	5804	4	6.89
Jan – June 2014	4975	5	10.1
Total	**55 596**	**51**	**9.17**

Table IV: Maternal characteristics and outcomes following eclampsia.

Characteristics and outcomes	First audit (n=42)		Second audit (n=9)	
	n (%)	mean (SD)	n (%)	mean (SD)
Maternal age (years old)		26.1 (6.08)		25.8 (5.36)
Systolic BP (mmHg)		156.4 (20.91)		159.9 (35.86)
Diastolic BP (mmHg)		90.4 (14.54)		104.1 (16.39)
Parity				
Primid	34 (81.0)		5 (55.6)	
2-5	7 (16.6)		4 (44.4)	
>5	1 (2.4)		0	
Ethnicity				
Malay	29 (69.0)		6 (66.7)	
Chinese	1 (2.4)		0	
Indian	8 (19.1)		2 (22.2)	
Others	4 (9.5)		1 (11.1)	
Occupation				
Housewife	25 (59.6)		8 (88.9)	
Private Sector	9 (21.4)		1 (11.1)	
Government	4 (9.5)		0	
Own Business	4 (9.5)		0	
Gestational age at delivery (week)				
24 - 31	6 (14.3)		2 (22.2)	
32 - 36	13 (30.9)		3 (33.4)	
37 - 41	22 (52.4)		4 (44.4)	
Unsure / unbooked	1 (2.4)		0	
Pregnancy stage when eclampsia occurred				
Antepartum	23 (54.8)		4 (44.4)	
Intrapartum	10 (23.8)		1 (11.2)	
Postpartum	9 (21.4)		4 (44.4)	
Mode of delivery				
SVD	10 (23.8)		2 (22.2)	
LSCS	31 (73.8)		6 (66.7)	
Forcep / vacuum	1 (2.4)		1 (11.1)	
Recurrent eclamptic fits				
Yes	8 (19.0)		1 (11.1)	
No	34 (81.0)		8 (88.9)	
Maternal outcome				
Alive	40 (95.2)		8 (88.9)	
Dead	2 (4.8)		1 (11.1)	

BP, blood pressure; SVD, spontaneous vertex delivery; LSCS, lower segment caesarean section.

Table V: Neonatal outcome following eclampsia

Characteristics and outcomes	First audit (n=42)		Second audit (n=9)	
	n (%)	mean (SD)	n (%)	mean (SD)
Birth weight (gram)		2379.8 (924.73)		2330.0 (782.24)
Birth weight (gram)				
≤ 500	0		0	
501 – 750	2 (4.8)		0	
751 – 1000	2 (4.8)		1 (11.1)	
1001 – 1500	6 (14.3)		2 (22.2)	
1502 – 2500	12 (28.5)		2 (22.2)	
>2500	20 (47.6)		4 (44.4)	
Apgar score at 5 minutes				
0	3 (7.1)		3 (33.3)	
1-2	2 (4.8)		0	
3-6	4 (9.5)		0	
≥ 7	33 (78.6)		6 (66.7)	
Neonatal outcome				
Stillbirth	3 (7.1)		3 (33.3)	
Early neonatal death	1 (2.4)		0	
No adverse outcome	38 (90.5)		6 (66.7)	

Table VI: Adherence to audit criteria

Audit Criteria	Before implementation (total cases=42) n (%)	After implementation (total cases=9) n (%)
Detailed history and documentation	42 (100)	9 (100)
Activation of red alert system	21 (50.0)	8 (88.9)
Specialist involved in management plan	42 (100)	9 (100)
Use of mgso4	42 (100)	9 (100)
Treatment of high blood pressure	40 (95.2)	9 (100)
BP measurement ¼ hourly	42 (100)	9 (100)
Urine analysis for proteinuria	42 (100)	9 (100)
Input output chart maintained for 48 hour	42 (100)	9 (100)
Deep tendon reflexes test	42 (100)	9 (100)
Respiration rate monitored for 24h	42 (100)	9 (100)
Urgent delivery made	42 (100)	9 (100)
PE profile for all eclampsia patients	42 (100)	9 (100)

Eclampsia is usually treated with urgent delivery, which probably explains the observed increase rate of cesarean delivery and risk for preterm birth and low birth weight. Ann KL *et al.* also found the same trend in mode of delivery in which almost half of eclamptic women in her population delivered via caesarean section. [13] Perinatal mortality rate from eclampsia in this audit was 0.13 per 1000 births, much lower than total national perinatal mortality rate in 2010. [14]

As mentioned earlier, 19% of women hospitalized for eclampsia had experienced eclamptic fits more than once. This issue triggered the authors to conduct this audit on the management of eclampsia in this hospital. The aim is to allow quality improvement to take place where it will be most helpful and will improve outcomes for patients. In most obstetric adverse event like eclampsia, quick recovery depends on the proper initial action. Failure to follow the standard management criteria will put mother and newborns at risk of mortality or permanent disabilities. The first audit found that two standard criteria which were not adhered fully while managing the eclampsia cases were 'activation of red alert system' and 'treatment for high blood pressure'.

Red Alert System in obstetrics is a system to alert staff on duty to various obstetrics emergencies. The use of this system is intended to convey essential information quickly and with minimal misunderstanding to staff. This system will fasten multidisciplinary involvement in managing any emergency cases. Further evaluation on cases which show delay in activating the red system revealed that those cases were first attended by junior staff (house officer, junior medical officer / midwives). The junior staff may lack training and exposure to handle an emergency situation, thus delaying activation of the red alert. Furthermore, our units may manage only one case in a month, and with high staff turnover, how is this experience to be gained? In some cases, initial treatment to eclamptic patients was delayed as the junior staff taking time calling each doctor on duty to come for help. Eclampsia is such a potentially dangerous condition that needs comprehensive care in order to prevent both maternal and fetal morbidity and mortality. Hence, immediate multidisciplinary assessment and treatment is mandatory.

On the other hand, there were two cases that failed to adhere to criteria No.5 – treatment for high blood pressure. When these two cases were evaluated, we found that both patients had the first seizure during the postpartum period at home. Neither patients nor their family members seek medical attention after the seizures until it was found out by the nursing staff the following day during home visit. Blood pressure was already within the normal range when patients brought to the hospital and explained why these two patients did not received treatment for high blood pressure. Delay in bringing the patient to the hospital maybe be due to a lack of awareness about early signs that trigger the seizures and the need to call for help if the seizures occurred. In line with the thinking of other authors, [15] we believe that continuous post-delivery care is essential, especially during the home visit to this high-risk group by health clinic staff for up to six weeks post delivery. All patients should be encouraged to seek medical attention if they had any new onset of high blood pressure or pre-eclampsia symptoms, even after delivery.

Strategies for change, as listed in Table II, were discussed and implemented. There was an improvement in quality of patient management and outcome in the second audit. These improvements were observed within six months following implementation of the recommendations from the first audit. For example, percentage of cases that did activate the Red Alert system increased from 50% to 88.9% after changes were implemented. Furthermore, all patients were treated with intravenous anti-hypertensives for uncontrolled blood pressure following eclampsia.

The most important change in outcome was reduction in the number of cases with recurrent eclamptic fits. Out of nine cases reviewed during the second audit, only one patient experienced more than one fit, a reduction from 19% to 11.1%. Apart from that, perinatal mortality rate due to eclampsia also has decreased from 0.07 per 1000 births to 0.05 per 1000 births during the second audit. Although not remarkably improved, this findings shows promising results for the changes that have been made to elevate the standard of care. However, no reduction in the percentage of maternal death was seen. Thus, continuous effort is essential to improve the management of this obstetrics emergency for better patient outcome. A further audit using the same standards is planned at a yearly interval.

Although the findings from this study are positive, the main limitations included fewer cases in the second audit than in the first audit; this is due to short duration of conducting the

second audit. Second, analysis based on data obtained from patient's Bed Head Ticket (BHT) is prone to a certain degree of coding errors and incompleteness. Since this hospital has practiced computerized data entry for each patient, we did compare data from BHT with patient's medical computerized record and ultimately, it has minimized any data incompleteness between the two data source.

CONCLUSION

Adherence to the best-standardized criteria is important to eliminate loopholes in under management of eclampsia cases and to provide the best care to lessen the degree of maternal and neonatal mortality and morbidity. Failure to comply with best-standardized practice might result in sub-standard care that may translate into increasing mortality and morbidity both for mother and newborn. This audit has provided an opportunity for all the staff involved in managing the eclampsia to check their performance against the standardized criteria.

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